# ITEM 400

# EXCAVATION, TRENCHING AND BACKFILLING

*This item shall govern the excavation, trenching and backfilling for storm drainage pipe, and pipe culverts, unless otherwise noted on the plans, details and the specifications. The work shall include all necessary pumping or bailing, sheeting, drainage and the construction and removal of any required cofferdams. All existing utilities shall be protected from damage during the excavation and backfilling of trenches, and if damaged, shall be replaced or repaired by the Contractor at his expense. Unless otherwise shown on the plans and bid proposal all excavation shall be unclassified, and shall include all materials encountered regardless of their nature or the manner in which they are removed.*

**EXCAVATION:**

The Contractor shall perform all excavation of every description and of whatever substances encountered, to the lines and grades shown on the plans or determined by the Engineer. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and properly disposed of by the Contractor or as directed by the Engineer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work, adjoining property, and for the safety of the personnel. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled, if in the opinion of the Engineer, the pipe or structure can be safely and properly installed or constructed, and backfill can be properly tamped in such tunnel sections.

If the Contractor encounters hazardous substances, industrial waste, environmental damage, underground storage tanks, or conditions conductive to environmental damage, Contractor shall immediately stop work in the area affected and report the condition to the Owner's representative in writing. Contractor shall not be responsible for or required to conduct any investigation, site monitoring, containment, cleanup, removal, restoration or other remedial work of any kind or nature (the "remedial work") under any applicable level, state or federal law, regulation or ordinance, or any judicial order. If the Contractor agrees in writing to commence and/or prosecute some or all of the remedial work, all costs and expenses, to include any extension of the contract time, of such remedial work shall be paid by Owner to Contractor as additional compensation.

**TRENCHING:**

1. Trench walls shall be vertical and the practice of undercutting at the bottom or flaring at the top will not be permitted unless at the Engineer's discretion. In special cases where trench flaring is permitted and directed by the Engineer, the trench walls shall remain vertical to a depth of at least 1 foot [305 mm] above the top of the pipe. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of pipe on the undisturbed soil at every point along its entire length, except for the portions of pipe sections where it is necessary to for bells and for the

proper sealing of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded in order that the pipe may rest upon the prepared bottom for as nearly its full length as practicable. Whenever over-excavation occurs, the under-cut trench shall be restored to grade, to the satisfaction of the Inspector, by replacement of excavated material compacted to the same density as the surrounding natural ground.

Whenever wet or otherwise unstable soil that is incapable of properly supporting the structure or pipe, as determined by the Engineer, is encountered in the bottom of the trench, such soil shall be removed to the depth shown on the plans or determined by the Engineer and the trench backfilled to the proper grade with a subgrade filler as specified in Item No. 410, "Gravel Subgrade Filler".

The depth of cut indicated on cut sheets, as furnished by the Consultant, is from the offset or cut hub elevation to the invert of the pipe. The width of the trench shall be at least the outside diameter of the pipe plus 6 inches [152 mm] on each side of the pipe for pipe sizes less than 42 inches [1050 mm] in diameter.

The maximum working room for pipe 42 inches [1050 mm] in diameter and under shall not exceed ½ of the outside diameter of the pipe or 12 inches [305 mm] whichever is greater, from the edge of the pipe to the face of the trench walls, or inside face of the shoring protection. For pipe over 42 inches [1050 mm] in diameter the maximum width of the trench shall be such that the working space from the pipe to the trench wall, or shoring protection as the case may be, will be a minimum of 12 inches [305 mm], and a maximum of 24 inches [610 mm]. If allowable trench widths are exceeded through over-shooting of rock, caving of earth trenches or over-excavation, the Contractor shall employ corrective measures or alternative designs as determined by the Engineer.

It shall be understood that the depth of cut as indicated on the cut sheet may be more or less than the actual excavated depth due to ground conditions existing at the site. For this reason the Consultant shall determine the depth for pay purposes based on the surface elevation prior to the Contractor's operation and the invert of the sewer line. The Consultant's decision shall be final.

2. Where water, silt, muck, trash, debris or rock in ledge, boulder or coarse gravel particle size larger than 1 ¾ inch [44 mm] is encountered at the bearing level, the Contractor shall, as directed by the Inspector, under-excavate and remove such materials to a depth not less than 4 inches [102 mm] below the bottom of the pipe and replace with a material conforming to the requirements of Item 410, "Gravel Subgrade Filler".

## BACKFILLING:

1. General: Trench shall not be backfilled until the constructed structures or appurtenances as installed conform to the requirements specified. The trench shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, flexible base material, sand an gravel, soft shale or other approved materials, free from large clods of earth or stones.

Where pipe is specially coated for protection against corrosion, care shall be taken not to damage the coating. Any trench improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and compaction. The use of sand backfill shall not be allowed.

All compaction shall be such that the apparent dry density of each layer shall not be less than ninety percent (90%) of the maximum dry density as determined by tests on samples as outlined in TXDOT Testing Method Tex 113-E, unless otherwise shown on the plans.

2. Storm Drainage Pipe Backfilling: Initial backfill that is defined as backfilling to a point 12 inches [305 mm] above the top of the pipe shall be done by either method (a), (b) or (c)

below. Secondary backfill that is defined as backfilling from a point 12 inches [305 mm] above the top of the pipe to the top of the trench or proposed subgrade elevation shall be done by method (d) below.

(a). Material for initial backfill shall be selected fine compactable soil material. It shall be compacted at near optimum moisture content in layers not to exceed 6 inches [152 mm] in compacted thickness. Each layer shall be compacted to the required density by approved hand or mechanical tamping equipment.

Care shall be exercised to thoroughly compact the backfill under the haunches of the pipe and to insure that the backfill soil is in intimate contact with the sides of the pipe. Backfill material shall be kept at the same elevation on both sides of pipe.

(b). A clean gravel or gravel approved by the Engineer, conforming to the requirements of Item No. 410, "Gravel Subgrade Filler", may be used for backfill material. The gravel shall be placed in the trench and lightly tamped to consolidate and seal the mass against the conduit and earthen surfaces. Backfill material shall be kept at the same elevation on both sides of pipe.

A filter fabric shall be placed between the top of the gravel backfill and the secondary backfill for the entire length and width of the trench. The filter fabric shall conform to the requirements of Texas Department of Transportation Material Specification 6200, Type1.

(c). Cement Stabilized Backfill shall conform to "Class D" Concrete as defined in Item No. 300 "Concrete" of these specifications. Cement Stabilized Backfill shall be placed within one (1) hour after mixing and shall be placed and rodded in such a manner as to completely fill the backfill area.

Before placing Cement Stabilized Backfill, the trench shall be cleaned of any extraneous material and thoroughly wet. All surplus dirt excavated from the ditch shall be removed from the site.

(d). Secondary Backfill: After the initial backfill has been completed to a point 12 inches {305 mm] above the top of the pipe by one of the methods outlined above, suitable rolling equipment may be used on these portions which are accessible to such equipment to obtain the compaction effect. Material for backfill shall be placed in uniform layers no more than 12 inches [305 mm] in depth (loose measurement) and shall be compacted to the density specified herein. Each layer of backfill material, if dry, shall be wetted uniformly prior to placement in the trench to the moisture content required to obtain the specified density, and shall be compacted to the required density by means of rolling equipment or other suitable mechanical method. No rolling equipment shall be used which may damage the pipe.

## DISPOSAL OF EXCAVATED MATERIALS:

The excess excavated material not utilized after all fill requirements have been met, shall become the property of the Contractor and he shall dispose of it by hauling and wasting outside the limits of the right-of-way of this project and of public thoroughfares and water courses, in conformity with pertinent City ordinances and in a manner meeting the approval of the Engineer.

## QUALITY CONTROL:

In-place density tests shall be done by one of the City's on-call construction materials testing firms at the City's expense for the City's Capital Improvement Projects. For private development, any cost associated with in-place density tests shall be observed by the developer or the utility agency installing a utility line.

The frequency and location of testing shall be in accordance with the following table:

| Secondary Backfill Depth (Ft) | Number of Tests per 400 Linear Feet |
|---|---|

| Secondary Backfill Depth (Ft) | Number of Tests per 400 Linear Feet |
|---|---|
| 0 – 6 | 3 |
| 6 – 12 | 5 |
| > 12 | 7 or as directed by the Engineer |

The number of tests shown above is a minimum. The Engineer may require more tests if there is a need.

Any failed test shall require the Contractor to remove and replace or rework as required the layer of backfill to points halfway to the next test location at no additional cost. Retests of these areas shall be at the Contractor's expense.

The Contractor shall provide access to the test area, associated trench excavation safety protection, and backfilling of the test areas at the Contractor's expense.

**MEASUREMENT:**
Excavation, Trenching and Backfill will not be measured for payment.

**PAYMENT:**
No direct payment shall be made for excavation, trenching and backfilling for pipe culverts, pipe storm sewers, and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

No direct payment shall be made for placement of filter fabric and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

Excavation for reinforced concrete box culverts will be measured and paid for at the contract unit price bid per cubic yard [cubic meter] under Item No. 106, "Box Culvert Excavation and Backfill".

Subgrade filler will be measured and paid for at the contract unit price as provided for in Item No. 410, "Gravel Subgrade Filler".